CLAIMS

What is claimed is:

1. A coupler that is adapted to engage a cylindrical concave internal surface of a cylindrical opening of a torque receptor comprising:

a shaft that rotates around a center axis, said shaft having at least two cam driving surfaces that are spaced substantially equally from said center axis and that are adapted to transmit torque applied to said shaft;

at least two gripping shells having axial end portions and convex external gripping surfaces that have a cylindrical convex profile and that slidingly engage said cylindrical concave internal surface, said gripping shells further including internal cam follower surfaces that are adapted to be engaged by said cam driving surfaces so that torque applied to said shaft is transmitted from said cam driving surfaces to said internal cam follower surfaces so that said center axis of said shaft is substantially aligned with a center axis of said cylindrical opening; and

retaining recesses that axially and radially retain said gripping shells on said coupler adjacent said shaft and that allow said gripping shells to move freely in a radial direction and that allow said gripping shells to automatically engage said cylindrical concave internal surface of said cylindrical opening.

2. The coupler of claim 1 wherein said cylindrical opening comprises a cylindrical opening in a drive shaft.

3. The coupler of claim 1 wherein said cylindrical opening comprises a cylindrical opening in a pipe.

4. The coupler of claim 1 wherein said coupler comprises a wrench.

5. The coupler of claim 1 wherein said coupler comprises a drive coupler for a driveshaft.

6. The coupler of claim 1 further comprising a collar connected to said coupler that forms a cylindrical opening between said gripping shells and an interior cylindrical surface of said collar that is adapted to receive said torque receptor and provide structural support for said torque receptor to prevent ovaling of said torque receptor.

7. A wrench for engaging an internal surface of a pipe and turning said pipe in either direction comprising:

a shaft that rotates around a center axis, said shaft having at least two cam driving surfaces that are spaced substantially equally from said center axis for transmitting torque applied to said shaft;

at least two gripping shells having external convex gripping surfaces that are cylindrically shaped, said external convex gripping surfaces disposed on said gripping shells to slidingly engage said cylindrically shaped concave internal surface of said pipe, said gripping shells further including internal cam follower surfaces that are designed to be engaged by at least two cam driving surfaces on said shaft so that said torque applied to said shaft is transmitted to said at least two gripping shells from said center axis in a direction that is substantially transverse to said center axis so that said gripping shells apply force to said cylindrically shaped concave internal surface of said pipe and said center axis of said shaft is substantially aligned with a center axis of said pipe; and

a retainer that engages said gripping shells to retain said gripping shells on said wrench adjacent said shaft and allows said shells to freely move, without being biased, in a direction that is transverse to said center axis to automatically open and engage said internal surface of said pipe.

8. The wrench of claim 7 further comprising:

shoulder surfaces disposed on said gripping shells adjacent each external gripping surface that are aligned to engage a butt end of said pipe upon insertion of said wrench into said pipe, said shoulder surfaces causing said gripping shells to at least partially rotate with said pipe when said shaft is rotated around said center axis as a result of said torque applied to said shaft so that said gripping shells expand and engage said internal surface of said pipe.

9. The wrench of claim 8 wherein said shoulder surfaces have a frictional surface formed thereon to increase friction between said butt end of said pipe and said gripping shells to cause said shells to at least partially rotate with said pipe.

10. The wrench of claim 8 further comprising:

a recessed portion disposed in said gripping shells between said gripping surfaces and said shoulder to accommodate ridges that may exist at a butt end of said pipe.

11. The wrench of claim 7 wherein said external gripping surface comprises teeth.

12. The wrench of claim 7 wherein said external gripping surface comprises a hard material.

13 The wrench of claim 7 wherein said external gripping surface comprises a malleable surface.

14. The wrench of claim 7 wherein said at least two gripping shells have multiple stages of gripping surfaces having multiple diameters.

15. The wrench of claim 7 wherein said cam driving surfaces of said drive shaft are substantially flat.

16. The wrench of claim 7 wherein said retainer comprises recessed portions adapted to engage lips formed on axial ends of said gripping shells.

17. The wrench of claim 7 further comprising a socket driver that is attached to said shaft and that is adapted to receive a ratchet wrench to apply torque from said ratchet wrench to said shaft.

18. The wrench of claim 7 further comprising a socket driver that is attached to said shaft and that is adapted to receive a powered rotational device to apply torque from said powered rotational device to said shaft.

19. The wrench of claim 18 wherein said powered rotational device is an air ratchet.

20. The wrench of claim 18 wherein said powered rotational device is a power drill.

21. The wrench of claim 7 wherein the said cam surfaces are adapted to turn said pipe in a single direction.

22. The wrench of claim 7 further comprising a collar connected to said coupler that forms a cylindrical opening between said gripping shells and an interior cylindrical surface of said collar that is adapted to receive said pipe and provide structural support for said pipe to prevent ovaling of said pipe.

23. A method of fabricating a wrench that is adapted to engage the internal surface of a pipe to turn said pipe comprising:

providing a shaft adapted to receive a torque to turn said pipe around a center axis of said shaft, said shaft having at least two cam surfaces that are adapted to transmit torque applied to said shaft;

providing at least two gripping shells each having at least one external gripping surface and at least one internal cam follower surface, said external gripping surface having a convex cylindrical shape that slidingly engages said concave cylindrically shaped internal surface of said pipe, and said internal cam follower surface being adapted to engage at least one of said cam driving surfaces on said drive shaft so that torque applied to said shaft is substantially symmetrically transmitted to said at least two gripping shells from said shaft in a direction that is substantially transverse to said center axis so that said gripping shells apply force to said concave cylindrically shaped internal surface of said pipe and said center axis is substantially aligned with a center axis of said pipe; and

providing a retainer that engages said gripping shells to retain said gripping shells on said wrench adjacent said shaft and allows said shells to move freely, without being biased in said substantially transverse direction so that said shells automatically open and engage said internal surface of said pipe.

24. A method of turning a pipe with an internal pipe wrench comprising:

gripping a concave cylindrical internal surface of said pipe with one or more gripping shells of said internal pipe wrench, said gripping shells having convex gripping surfaces that are cylindrically shaped to slidingly engage said concave cylindrical internal surface of said pipe, said gripping shells further including cam follower surfaces that are adapted to be engaged by cam driver surfaces of a cam driver that apply torque to said cam follower surfaces causing said gripping shells to expand and engage said internal surface of said pipe so that said pipe is substantially aligned with said center axis, said gripping shells retained on said internal pipe wrench with a retainer that allows said gripping shells to move freely, without being biased so that said gripping shells automatically open and engage said concave cylindrical internal surface of said pipe whenever torque is applied to said cam driver;

applying a torque in either direction to said cam driver to cause said gripping shells to expand and engage said cam follower surface of said gripping shells; and

turning said pipe in said direction of said torque.

25. A coupler that is adapted to engage a cylindrical concave internal surface of a cylindrical opening of a torque receptor comprising:

a shaft that rotates around a center axis, said shaft having at least two cam driving surfaces that are spaced substantially equally from said center axis and that are adapted to transmit torque applied to said shaft;

at least two gripping shells having axial end portions and convex external gripping surfaces that have a cylindrical convex profile and that slidingly engage said cylindrical concave internal surface, said gripping shells further including internal cam follower surfaces that are adapted to be engaged by said cam driving surfaces so that torque applied to said shaft is transmitted from said cam driving surfaces to said internal cam follower surfaces so that said center axis of said shaft is substantially aligned with a center axis of said cylindrical opening;

retaining recesses that axially and radially retain said gripping shells on said coupler adjacent said shaft and that allow said gripping shells to move freely in a radial direction and that allow said gripping shells to automatically engage said cylindrical concave internal surface of said cylindrical opening; and

a driver connected to said shaft, said driver having a cylindrical collar portion that is substantially aligned with said center axis, said cylindrical collar portion having an interior cylindrical surface that is adapted to receive said torque receptor and provide structural support for said torque receptor to prevent ovaling and structural failure of said torque receptor.

26. A wrench for engaging an internal surface of a pipe and turning said pipe in either direction comprising:

a shaft that rotates around a center axis, said shaft having at least two cam driving surfaces that are spaced substantially equally from said center axis for transmitting torque applied to said shaft;

at least two gripping shells having external convex gripping surfaces that are cylindrically shaped, said external convex gripping surfaces disposed on said gripping shells to slidingly engage said cylindrically shaped concave internal surface of said pipe, said gripping shells further including internal cam follower surfaces that are designed to be engaged by at least two cam driving surfaces on said shaft so that said torque applied to said shaft is transmitted to said at least two gripping shells from said center axis in a direction that is substantially transverse to said center axis so that said gripping shells apply force to said cylindrically shaped concave internal surface of said pipe and said center axis of said shaft is substantially aligned with a center axis of said pipe;

a retainer that engages said gripping shells to retain said gripping shells on said wrench adjacent said shaft and allows said shells to freely move, without being biased, in a direction that is transverse to said center axis to automatically open and engage said internal surface of said pipe; and

a driver connected to said shaft, said driver having a cylindrical collar portion that is substantially aligned with said center axis, said cylindrical collar portion having an interior cylindrical surface that is adapted to receive said pipe and provide structural support for said pipe to prevent ovaling and structural failure of said pipe.